TNRCC REGULATORY GUIDANCE

Petroleum Storage Tank Division
RG-43
September 1996

SUBJECT: Groundwater Monitoring and Reporting

INTRODUCTION

This document provides guidelines for groundwater monitoring (sampling and gauging) and reporting at leaking petroleum storage tank (LPST) sites. Groundwater monitoring activities are needed at LPST sites to document any significant changes that may occur in the subsurface conditions. In most instances, one semiannual partial sampling event and two complete gauging events will be adequate to monitor groundwater conditions after the groundwater flow direction and contaminant levels have been documented through quarterly monitoring events. If a responsible party elects to conduct groundwater monitoring activities exceeding those required by this guideline or by the TNRCC case coordinator, the additional activities will not be allowable for reimbursement. Workplans and cost proposals for groundwater monitoring activities should continue to be submitted on an annual basis, but should only include costs to prepare one annual report. If a site is not eligible for reimbursement or a responsible party does not intend to seek reimbursement, only the workplan should be submitted.

SAMPLING

The following are guidelines for the sampling frequency of groundwater monitoring wells. These guidelines should **only** be considered after the groundwater contaminant levels have been well documented from previous sampling events. Only groundwater samples collected from adequately screened monitoring wells are considered representative of actual groundwater conditions.

- If the results of two successive quarterly sampling events indicate the contaminant concentrations detected in a specific monitoring well are comparable (approximately the same order of magnitude) to the concentrations previously detected, the sampling frequency for that particular well may be reduced to once every 6 months (semiannually).

- If the results of two successive quarterly sampling events indicate that the concentrations of the constituents analyzed (total BTEX, benzene, TPH, PAHs, etc.) have consistently remained at or below the site cleanup goals in a specific monitoring well, then the frequency of analysis for that particular constituent (or group of constituents) in the affected well(s) should be reduced to once per year (annually).

- Monitoring wells that are positioned either upgradient or outside the periphery of the contaminant plume boundary and yield nondetectable contaminant concentrations for two successive quarterly sampling events should be sampled once per year (annually). **This does not apply to the monitoring well situated immediately downgradient**

- The monitoring well situated immediately downgradient of the source area must be sampled during every sampling event.

- Following the installation of additional monitoring wells, all monitoring wells not containing nonaqueous-phase liquid (NAPL) should be sampled. This sampling event will fulfill the requirement for a quarterly, semiannual, or annual sampling event. Thereafter, the newly installed monitoring wells should be sampled on a quarterly basis only until contaminant levels are well documented.

- Regardless of contaminant concentrations, samples should be collected from all on-site and off-site monitoring wells not containing NAPL at least once per year, and these samples should be analyzed for all the appropriate constituents (based upon the substance released).

- The analysis of methyl tertiary butyl ether (MTBE) is necessary right after the installation of a monitoring well. Subsequently, it is necessary only in monitoring wells located downgradient or outside the periphery of a **gasoline** contaminant plume boundary.

- Monitoring wells that contain NAPL should not be sampled unless the TNRCC specifically requests laboratory analysis of the product to assist in product or source identification.

- The number of wells sampled and the sampling frequency should be reduced to a level sufficient for monitoring plume migration and/or the effectiveness of a remediation system.

GAUGING AND SUBMITTAL OF GROUNDWATER GRADIENT MAPS

The following are guidelines for the gauging frequency of monitoring wells and the submittal of updated, drafted groundwater gradient maps. These guidelines should only be considered once the groundwater flow direction has been well documented from previous gauging events. **Except when NAPL is present, the groundwater gauging frequency should coincide with the frequency of groundwater sampling events**

- If the groundwater flow direction at a site has essentially remained the same as that of the previous gauging event, then an updated groundwater gradient map should not be drafted and submitted for the current sampling event. If a site visit is conducted to sample any wells, all existing wells should be gauged and inspected for damage during the visit. Additionally, tankpit observation wells should be gauged for the presence of NAPL during each gauging event, but the groundwater elevations from these wells should not be incorporated into the groundwater gradient map unless the tankpit water is hydrologically continuous with the native groundwater.

- Following the installation of additional monitoring wells, all monitoring wells should be gauged, and an updated, contoured groundwater gradient map should be constructed, drafted, and submitted. Unless the direction of groundwater flow changes significantly, an updated, contoured groundwater gradient map needs to be drafted and submitted only on an annual basis.

- When NAPL is present, the gauging frequency should be based on product thicknesses and method of product recovery.

REPORTING

Following the completion of groundwater monitoring activities for a period of one year, an annual groundwater

monitoring report that contains the results of all sampling and gauging events for that year should be prepared and submitted to the TNRCC. The report should summarize the monitoring events for the past year and provide a discussion of any significant changes that may have occurred in the subsurface conditions. Annual monitoring reports should contain the following information:

I. Report Summary

! A brief and concise overview of all information contained in the report.

! A brief description of the groundwater monitoring activities covered by the report that includes the degree of contamination encountered.

II. Chronology of Events

! The dates and brief descriptions of all significant events that have occurred since a problem was suspected at the facility. Begin with the first date a problem was suspected and continue through the most recent activity described in the report.

! After submittal of the initial report chronology, each subsequent chronology of events should be a continuation of the previous chronology.

III. Tables and Maps

! A cumulative list of analytical results. The results should be tabulated such that each sampling date is listed under each monitor well in chronological order from oldest to most recent. Each chemical must be specified (e.g., benzene, toluene, ethylbenzene, total xylenes, etc).

! A cumulative list of groundwater-level measurements and NAPL thickness measurements (when phase-separated product is present). This list should include surveyed top-of-casing elevations, depth-to-water measurements, calculated groundwater elevations, and the date of measurement. If product is present, the apparent product thickness and correction factor used to adjust the apparent thickness should be indicated. The results should be tabulated such that each measuring event is listed under each monitor well in chronological order from oldest to most recent.

! An updated hydrocarbon distribution map for each complete sampling event. This map should portray the dissolved-phase contaminant concentrations for benzene, total BTEX, and TPH, any other constituent specifically requested by the TNRCC, or phase-separated product thickness for each well.

! Groundwater gradient map(s).

! An account of the disposition of any recovered NAPL and contaminated groundwater. If these wastes/materials are transported off-site for disposal, treatment, storage, or recycling, then copies of signed receipts from receiving facilities or any uniform hazardous waste manifests (if required) must be submitted.

IV. Conclusions and Recommendations

! A discussion of any trends or changes noted in analytical results or site conditions and a summary of any ongoing assessment or remediation activities. If applicable, provide a brief discussion of the effectiveness

of the current remediation system and a proposal for any recommended system modifications.

V. Quality Assurance/Quality Control Procedures

! A description of the standard quality assurance/quality control (QA/QC) procedures that are practiced in order to ensure that samples collected are representative of actual conditions and that analytical results are valid.

! A concise discussion of the specific sampling techniques employed during the collection of all groundwater samples.

! A description of the EPA-approved methods used to extract and analyze the samples submitted to the laboratory. Reference the maximum recommended sample holding time for each type of analysis preformed.

VI. Appendices

! Copies of signed laboratory reports providing the results of all sample analyses, including QA/QC laboratory data sheets confirming the use of blanks, surrogates, spike recoveries, and any other required QC measures taken to ensure the validity of the data.

! Copies of all corresponding chain-of-custody documentation.

! A detailed description of sample collection, preservation, and analytical procedures for all samples collected during that year.

! A cumulative list of groundwater-level measurements and product thickness measurements, when applicable.

! Waste/material disposition records.

A case coordinator may request the submittal of groundwater monitoring information on a more frequent basis if deemed necessary, based on site-specific conditions. Cumulative tables of analytical results and groundwater elevation data should be maintained throughout the annual monitoring cycle and attached to any proposals or reports submitted to the TNRCC for review. These cumulative tables should include the most current groundwater monitoring results and should be made available to the TNRCC during the course of the annual monitoring cycle if specifically requested by the case coordinator.

GROUNDWATER MONITORING AND REMEDIAL ACTION

Please note that the change to just annual reporting applies to routine groundwater monitoring only. Groundwater sampling, gauging, and reporting associated with remedial action performance monitoring or operation and maintenance monitoring may require different frequencies as set forth in other guidance documents or as directed by the case coordinator. Such monitoring programs should be developed and proposed as part of proposed remedial action plans. Therefore, if a site has entered the remediation phase, and the groundwater monitoring and reporting frequency has already been approved, the approved activities should be completed. Future monitoring and reporting frequencies should be determined based on available guidance or as approved by

a case coordinator, based on site-specific conditions. In most cases, groundwater monitoring results will be reported annually in a remediation system performance report.

FINAL MONITORING

The following are reporting requirement guidelines for final groundwater monitoring activities. Final monitoring should only be implemented once the responsible party has documented, and the TNRCC has concurred, that either a) the site appears to be adequately cleaned by the remediation system and the remediation system can be shut off or b) the documented contaminant levels are at or below the site cleanup goals for all monitoring wells.

- All on-site and off-site monitoring wells should be sampled and gauged on a three-month (quarterly) basis.

- Following the completion of four groundwater monitoring events, an annual groundwater monitoring report that contains the results of all four sampling and gauging events should be prepared.

- After the annual groundwater monitoring report has been completed, submit a *Site Closure Request* form (TNRCC-0028) if collected soil and groundwater monitoring data confirms that the site has been remediated to the site cleanup goals. If no further corrective action or monitoring is warranted, the TNRCC will grant approval for site closure. A *Final Site Closure Request* form (TNRCC-0030) should then be completed and submitted to the TNRCC to document actual site closure activities.